MWI 8715.10
REVISION A
EFFECTIVE DATE: June 25, 2001
EXPIRATION DATE: June 25, 2006

MARSHALL WORK INSTRUCTION

QS01

EXPLOSIVES, PROPELLANT, AND PYROTECHNICS PROGRAM

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DOCUMENT HISTORY LOG

Status (Baseline/ Revision/ Canceled)	Document Revision	Effective Date	
Baseline		12/27/99	
Revision	A	6/25/01	Renumbered document to be consistent with other 8715 series documents. Alphabetized paragraphs 3 & 4. Added paragraph 5.2 CERTRAK definition. Made editorial changes to paragraphs 6.1.1, 6.1.1.1.b, 6.1.1.1.f, 6.1.1.3, 6.1.1.3.b, 6.1.2.1, 6.1.2.3, 6.1.4.1, 6.1.4.2, 6.1.5.4b, 6.1.5.6a, 6.1.5.6.b, 6.1.6.1, 6.1.6.3a, 6.1.6.3b, and 6.1.6.3.b. Spelled out APRS, provided directions for forwarding requisitions to S&MA, and provided marking instructions in Paragraph 6.1.2.1. Added instructions for S&MA notification in Paragraph 6.1.2.5. Corrected paragraph 6.1.5.1 to provide the correct process. Deleted S&MA notification in paragraph 6.1.5.4a. Added paragraph 6.1.8, “Emergency Notifications”. Added paragraphs 9.5 & 9.6, records requirements. Added paragraph 10.2, recommended training. Updated paragraph 12 to reflect the proper cancellations.

1. PURPOSE

To provide general requirements and guidelines for all employees working with explosives, propellants, and pyrotechnics.

2. APPLICABILITY

These requirements and guidelines apply to all Government and contractor personnel at Marshall Space Flight Center (MSFC) involved in explosives, propellants, and pyrotechnics operations.

3. APPLICABLE DOCUMENTS

3.1 29 CFR 1910, “Occupational Safety and Health Standards”

3.2 CPIA Publication 394, “Hazards of Chemical Rockets and Propellants,” Volume III, “Liquid Propellants”

3.3 MSFC-SPEC-164, “Specification for Cleanliness of Components for Use in Oxygen, Fuel, and Pneumatic Systems”

3.4 MWI 8715.6, “Hazardous Operations”

3.5 NPG 8715.3, “NASA Safety Manual”

3.6 NSS-1740.12, “NASA Safety Standard for Explosives, Propellants, and Pyrotechnics”

3.7 NSS-1740.15, “Safety Standard for Oxygen and Oxygen Systems”

3.8 NSS-1740.16, “Safety Standard for Hydrogen and Hydrogen Systems”

3.9 W31RX1-95137-004, “Interservice Support Agreement Between MSFC and AMCOM”

4. REFERENCES

4.1 AMC-R 385-100, Department of the Army, “Safety Manual”

4.2 MWI 3410.1, “Personnel Certification Program”

4.3 MPG 4500.1, “Management of Propellants and Pressurants”

4.4 MSFC-STD-1800, “Electrostatic Discharge Control (ESD) for Propellant and Explosive Devices”

5. DEFINITIONS

5.1 APRS. Automated Procurement Request System.

5.2 CERTRAK. The Safety and Mission Assurance (S&MA) Office software data base system used for employee certification records.

5.3 DOT. Department of Transportation

5.4 ESDB. Explosive Storage and Demolition Branch (U.S. Army, Redstone Arsenal).

5.5 Explosives. Any chemical compound or mechanical mixture that, when subjected to heat, impact, friction, detonation, or other suitable initiation, undergoes a very rapid chemical change with the evolution of large volumes of highly heated gases that exert pressure in the surrounding medium.

5.6 Hypergolic. Propellants which are self-igniting upon contact of fuel and oxidizer, without a spark or external aid.

5.7 ISC. Institutional Support Contractor.

5.8 PMG. Property Management Group.

5.9 Propellant. Any substance, or combination of substances, liquid or solid, that when ignited, propels or provides thrust through a deflagration reaction. A propellant is an explosive that is suitable for effecting the controlled propulsion of a solid body.

5.10 Pyrophoric. Chemicals which ignite spontaneously in air; usually used as an ignition source for liquid engines and hybrid rocket motors. A commonly used pyrophoric at MSFC is triethelaluminum/triethylborane or TEA/TEB.

5.11 Pyrotechnic. Any item or device manufactured from explosive or chemical ingredients, including powdered metals, that is capable of deflagration or detonation. Pyrotechnic devices are generally designed to produce large quantities of heat and/or light instead of large volumes of high-pressure gases.

(See NSS-1740.12 for a comprehensive list of definitions.)

6. INSTRUCTIONS

6.1 Management of Explosives, Solid Propellants, and Pyrotechnics

6.1.1 General

All organizational elements of MSFC will coordinate and control incoming and outgoing movements of explosives and will ensure compliance with DOT regulations and MSFC operational and safety standards. Only the minimum quantities of explosives will be on hand in support of approved projects. The PMG will ensure that any quantities of explosives, excess to the customer's immediate needs, are disposed of using the processes and resources of the ESDB, U.S. Army, Redstone Arsenal. Accountability of explosives will be maintained until they are expended in use, turned in as excess, or disposed of.

6.1.1.1 MSFC directorates/offices requiring the use of explosives will:

a. Establish requirements for such materials and devices to be consistent with approved programs and projects.

b. Provide Safety and Mission Assurance (S&MA) a list of personnel to be trained and designated as authorized to request, receive, install, and otherwise use explosives in support of approved programs and projects. Upon completion of certification requirements, provide a list of authorized personnel to PMG and ESDB. Qualified personnel will perform receipt, storage, issue, turn-in, disposal, and shipment of explosives at all times.

c. Provide request to the Employee and Organizational Development Department for the training and certification of personnel designated to request, receive, install, and otherwise use explosives in support of approved programs and projects.

d. Assist PMG and support services contractors in the conduct of onsite inventories as required.

e. Ensure timely disposal of all explosives which are excess to the needs of MSFC or are determined to be of no further use due to deterioration, items becoming obsolete, or are considered unsafe for use.

f. Process all requests for issue, turn-in, or disposal of explosives through PMG to the ESDB.

6.1.1.2 S&MA will:

a. Assist MSFC directorates/offices in ensuring compliance with established safety procedures pertaining to the use and handling of explosives.

b. Conduct periodic inspections of facilities designated for receipt, storage, issue, and use of explosives for the purpose of ensuring compliance with MSFC safety policies and procedures.

c. Conduct such inspections as required under the terms of procurement contracts either onsite at the contractor's plant or at PMG receiving point as shipments of explosives arrive.

d. Assist PMG and using laboratories and offices in performing required inspections and inventories of explosives as needed to ensure compliance with contractual specifications.

6.1.1.3 Institutional Support Contractor (ISC), in support of PMG, will:

a. Process all requirements, receipts, issues, turn-ins, and disposal actions concerning MSFC-owned explosives.

b. Coordinate all actions pertaining to the above with the appropriate MSFC departments, offices, and ESDB.

c. Maintain the central accountable master inventory records for all MSFC-owned explosives.

d. Provide reports of inventory on an as-needed basis to the appropriate laboratories and offices within the Center.

6.1.2 Procurement Procedures

6.1.2.1 MSFC directorates/offices requiring the use of explosives will establish requirements for items to be procured through PMG. Organizations requiring explosives shall utilize the APRS. User organizations will forward requisitions (via email, memo, etc.) for explosives, propellants, and pyrotechnics to S&MA for review. All explosives will be marked as MSFC property with the MSFC point of contact and phone number and shipped to ESDB where they will be received and placed into storage until issued to the using organization. All shipments will be addressed as follows:

Transportation Officer
Explosive Storage and Demolition Branch
Building 8700
Redstone Arsenal, Alabama 35898-5330

6.1.2.2 Explosives that are to be used in programs, projects, and or tests at MSFC (including contractors), but were not purchased through APRS, shall be addressed as above and S&MA will be notified (via email, memo, etc.) before being forwarded to PMG and received at ESDB for storage.

6.1.2.3 ISC (and other support service contractors authorized to perform this service) will ensure transportation of explosives to MSFC locations.

6.1.2.4 MSFC directorates/offices requiring the use of explosives will provide S&MA, PMG, and ESDB a list of personnel certified and authorized to request, receive, and turn in explosives in support of approved programs and projects. DA Form 1687, “Notice of Delegation of Authority – Receipt for Supplies,” shall be used.

6.1.2.5 S&MA must be notified in advance of any special inspection requirements. Notification may be via test plan, test requirements document, memo, or e-mail. The project/test requester will provide Material Safety Data Sheets (MSDS), drawings, and other data as appropriate. The explosives user will generate a work-authorizing document for this inspection and obtain S&MA approval.

6.1.3 Receipt Procedures

All explosives received at MSFC, including customer-owned products, will be processed through the ESDB, U. S. Army Redstone Arsenal, in support of PMG.

6.1.3.1 ESDB will accept shipment and verify DOT documentation, perform receiving inspection, “count and condition” verifications, and report discrepancies to ISC.

6.1.3.2 ISC will:

a. Process freight bills and release carrier to MSFC receiving point.

b. Prepare and forward necessary documentation to the Chief Financial Officer (CFO) for payment.

c. Notify S&MA of receipt and delivery to ESDB.

d. Receive inventory results and update master accountable records accordingly.

6.1.4 Storage Procedures

6.1.4.1 Storage of MSFC-owned explosives, solid propellants, and pyrotechnics shall be in S&MA-approved storage facilities/sites to ensure compliance with safety and security regulations:

- ESDB Storage Facilities, U.S. Army, Redstone Arsenal
- User Storage Facilities

6.1.4.2 Materials within specific storage locations will be stored in such a manner as to ensure compatibility. Questions concerning compatibility requirements should be addressed to S&MA and ESDB personnel.

6.1.4.3 User organizations will maintain a current and accurate inventory of all explosive, propellant, and pyrotechnic materials.

6.1.4.4 Explosives, solid propellants, and pyrotechnics will be stored in accordance with NSS-1740.12.

6.1.5 Issuance Procedures

6.1.5.1 When requesting a delivery of explosives being held at ESDB, MSFC Form 55 or APRS shall be used. Requests for issuance will be routed to S&MA (through the ESDB electronic system). ESDB will convert the request to DA Form 581, “Request for Issue and Turn-In of Ammunition,” for input into their system.

6.1.5.2 Routine requests will be prepared and submitted no earlier than 1 month, nor no later than 7 days, before the required date.

6.1.5.3 Emergency requests will be prepared and submitted no later than 3 full workdays prior to the required date.

6.1.5.4 Directorates/Offices will:

a. When requesting an issue or turn-in of explosives, use APRS or MSFC Form 55. MSFC organizations requesting the required material should include the name and phone number of the

individual authorized to receive the requested explosive and the specific point of delivery.

b. Forward approved MSFC Form 55 or APRS documentation to ISC.

6.1.5.5 ISC, in support of PMG, will review MSFC Form 55 or APRS documentation for completeness, accuracy, and necessary approvals and submit to PMG.

6.1.5.6 PMG will:

a. Review MSFC Form 55 or APRS documentation for verification of approvals and designation of certified and authorized personnel for receipt of requested materials.

b. Ensure delivery of requested material by the ISC distribution function or ESDB personnel to designated delivery point.

c. Update master accountable records.

6.1.6 Turn-In Procedures

6.1.6.1 Requesting directorates/offices will utilize APRS or MSFC Form 55 when requesting the turn-in of explosives to program stock. Process through ISC and include on the request the quantity, description, condition, lot, and serial number of materials for turn-in, the name of the individual who will turn the material over to PMG, and the specific pickup point.

6.1.6.2 ISC, in support of PMG, will review the APRS request or MSFC Form 55 for completeness, accuracy, and necessary approvals and submit to PMG.

6.1.6.3 PMG will:

a. Review MSFC Form 55 or APRS documentation for verification of approvals and designation of certified and authorized personnel to handle turn-ins.

b. Forward approved copy of MSFC Form 55 or APRS documentation to the ISC who will pick up explosives to be turned in and retain one copy for suspense.

c. Update master accountable records.

6.1.7 Disposal Procedures

When requesting explosive disposal services of ESDB, DA Form 581, "Request for Issue and Turn-In of Ammunition," shall be used. Forms will be processed through S&MA before being forwarded to PMG for review and approval and forwarded to ESDB for action.

6.1.8 Emergency Notifications

In any situation where it is deemed that the explosives, propellants or pyrotechnics in the area might have become unstable or pose an immediate explosive hazard, immediately evacuate the area and call 911 to report the situation.

6.1.9 Reports

6.1.9.1 PMG will establish, control, and maintain a master inventory system for explosives. All MSFC-owned explosives will be identified to specific program stock accounts within the explosive master accountable file that will be used to produce quarterly listings of program stock inventories.

6.1.9.2 These listings will be used by PMG for control and surveillance purposes and will be provided to using organizations within the Center as requested.

6.1.9.3 PMG will provide the Financial Management Office with a status of explosives inventory (line items and dollar value) to be included in the Center's program stock assets.

6.2 Safety Requirements for Explosives, Solid Propellants, and Pyrotechnics

6.2.1 All MSFC explosives, propellants, and pyrotechnics handling and processing shall be accordance with NSS-1740.12.

6.2.2 User organizations will identify all operations involving explosives, propellants, and pyrotechnics to S&MA.

6.2.3 User organizations will prepare and utilize detailed procedures, plans, drawings, and other documentation to safely control explosive operations in accordance with MWI 8715.6, "Hazardous Operations." Detailed procedures will be developed in accordance with NSS-1740.12.

6.2.4 User organizations will provide explosive operations documentation to S&MA for review and approval.

6.2.5 S&MA will review and approve all explosive operations documentation including plans, drawings, and operating procedures.

6.2.6 Personnel involved in transporting, storing, and handling explosives, propellants, and pyrotechnics will be certified in accordance with MWI 3410.1.

6.2.7 Control of Electrostatic Discharge (ESD) for explosive, propellant, and pyrotechnic operations will be in accordance with MSFC-STD-1800. User organizations will develop an ESD plan tailored to their activity.

6.2.8 User organizations or S&MA will perform hazard assessments on all phases of explosive, propellant, and pyrotechnic operations. S&MA will review and approve all hazard assessments.

6.2.9 S&MA will monitor explosive, propellant, and pyrotechnic operations to ensure compliance with safety plans, standards, and requirements.

6.2.10 User organizations or S&MA will perform quantity distance studies in accordance with NSS-1740.12 for all explosive, propellant, and pyrotechnic operations and storage facilities. S&MA will review and concur with all quantity distance studies.

6.2.11 Small arms ammunition storage areas are explosive sites that are not required to conform to NSS-1740.12. The following requirements apply to small arms ammunition storage:

6.2.11.1 User organizations shall provide the location, type, and number rounds to S&MA and the fire department.

6.2.11.2 Small arms ammunition shall not be stored together with Division 1.1, Division 1.2, or Division 1.3 explosives.

6.2.11.3 Small arms ammunition shall be separated from flammable liquids, flammable solids, and oxidizing materials by a distance of 15 feet or by a fire partition having a fire rating of at least 1 hour.

6.3 Pyrophoric/Hypergolic Fuels

6.3.1 Triethaluminum (TEA)/Triethyborane (TEB)

6.3.1.1 TEA/TEB systems and operations shall conform to the manufacturer's recommendations.

6.3.1.2 Full face shields, impervious clothing, including gloves, and aluminized suits, should be worn when handling TEA/TEB.

6.3.1.3 TEA/TEB systems should be designed for minimal usage and purging of all residual.

6.3.1.4 TEA/TEB shall not be stored with any other explosives or propellants.

6.4 Liquid Propellants and Pressurants

6.4.1 Procurement of propellants and pressurants will be in accordance with MPG 4500.1.

6.4.2 Flammable liquid and gaseous systems and components will be purged with an inert media prior to introduction of the flammable media to preclude the development of a flammable mixture.

6.4.3 Cryogenic systems will be purged prior to introduction of the cyogen to remove moisture from the system.

6.4.4 Propellant systems and components shall be cleaned to the requirements of MSFC-SPEC-164.

6.4.5 Hydrazine systems and operations will conform to the recommended precautions of CPIA Pub. 394, Volume III.

6.4.6 Hydrogen

6.4.6.1 Hydrogen systems and operations shall conform to the requirements of 29 CFR 1910 and NSS-1740.16.

6.4.6.2 Areas around hydrogen burnstacks should be maintained clear of vegetation and other combustibles for a radius of 100 feet.

6.4.7 RP1

RP1 systems and operations shall conform to the requirements of NSS-1740.12.

6.4.8 Oxygen

6.4.8.1 Oxygen systems and operations shall conform to the requirements of 29 CFR 1910 and NSS-1740.15.

6.4.8.2 Oxygen enrichment detection systems shall be provided in areas where release of oxygen could increase the oxygen level above 23%.

6.4.9 Nitrogen

6.4.9.1 Nitrogen systems and operations will conform to the recommended precautions of CPIA Pub. 394, Volume III

6.4.9.2 Oxygen detection systems shall be provided in areas where nitrogen release could reduce the oxygen level below 19.5%.

7. NOTES

None

8. SAFETY PRECAUTIONS AND WARNING NOTES

None

9. RECORDS

9.1 User organizations shall maintain usage and inventory records for all explosives. This record shall be maintained for 3 years, then destroyed.

9.2 Facility safety inspections shall be documented and retained for 5 years in accordance with 29 CFR 1960.26, then destroyed. S&MA maintains the facility safety inspection records in the HAZTRACK data base.

9.3 Master inventory records of all explosives will be maintained by ISC. This record shall be maintained for 3 years, then destroyed.

9.4 User organizations will maintain operating procedures, hazard assessments, and quantity distance studies for the life of the facility or operation then destroyed or maintained for historical purposes.

9.5 Records of any recommended employee training in section 10.2. These records shall be forwarded to the Employee and Organizational Development Department. This record shall be

maintained for the length of employment, then destroyed or maintained for historical purposes.

9.6 Certified employees shall forward copies of training to S&MA per MWI 3410.1, "Personal Certification Program," for inclusion in CERTRAK. This record shall be maintained in accordance with MWI 3410.1 requirements.

10. PERSONNEL TRAINING AND CERTIFICATION

10.1 Personnel involved in transporting, storing, and handling explosives, propellants, and pyrotechnics will be certified in accordance with MWI 3410.1. The Employee and Organizational Development Department will maintain official training records.

10.2 Recommended training for employees working with explosives:

10.2.1 NSTC 051, "Explosive Safety Management and Engineering," or an equivalent course providing basic information covering explosives safety engineering principles and requirements.

10.2.2 NSTC 009, "Explosives Handler's," or an equivalent course that provides the requirements for packing, shipping, handling, and storing explosives from a functional point.

10.2.3 NSTC 010, "Explosive Safety Program Management," or an equivalent course that addresses explosives a program management.

11. FLOW DIAGRAM

None

12. CANCELLATION

MWI 8715.10 dated December 27, 1999

Original Signed by
Sidney P. Saucier for

A. G. Stephenson
Director